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(54) Noise measurement for video signals

Rauschmessung für Videosignale

Mesure du bruit pour les signaux vidéo

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- **PATENT ABSTRACTS OF JAPAN vol. 12, no. 281 (E-641)(3128) 02 August 1988,& JP-A-63 059273**
- **PATENT ABSTRACTS OF JAPAN vol. 11, no. 169 (E-511)(2616) 30 May 1987;& JP-A-62001379**

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Description

This invention relates to a method and an apparatus for measuring the noise in video signals.

Television picture signals contain random noise from a variety of sources. These sources include electronic noise generated within the transmitter, within the receiver and in the environment between the transmitter and the receiver. Many television signal receivers contain noise reduction circuits that may be adjusted to reduce the level of noise on the received signal without adversely affecting the processing of the received television signal. Often, this noise reduction circuit is manually adjusted to a level of noise reduction corresponding to an average level of expected noise. When the noise received at a television receiver is more than expected, or less than expected, the manually adjusted noise reduction system will not be optimally adjusted. An automatic noise meaurement system may provide a means of controlling the noise reduction circuit in a television receiver so that low levels of noise reduction could be applied during the periods of low noise and high levels of noise reduction could be applied during periods of high noise.

Storey (US-A 4,249,209 and US-A 4,249,210) provides for a video noise reduction system that utilizes scans of the television signal to produce a difference signal. This difference signal is then applied to the noise reduction circuit. The picture information is chosen for successive scans. When the difference between the successive lines is too large, it is assumed that there is motion in the picture. When the difference is small, it is assumed that the difference is due to the noise in the signal. The noise signal is then scaled and passed to a noise reduction circuit. The system as provided by Storey is not able to continuously measure the noise that exists in a signal where the picture is changing rapidly.

Balbes et al. (US-A-4,189,755) provide for measuring noise on the sync tip of a composite television picture signal by clamping the sync tip signal to ground and then applying the clamped sync tip signal to a precision rectifier. The output of the rectifier represents the noise level in the signal and the level of the television signal is determined from the magnitude difference between the sync tip and the back porch. A signal-to-noise ratio signal is generated and the bandwidth of the receiver is adjusted in response to the signal-to-noise ratio signal.

The abstract of JP-A-6359,273 discloses a video signal noise reducing device in which no noise reduction is applied when a frame differential signal is larger than the level of a noise detection level setting apparatus; in that case, the frame differential signal is assumed to be the result of motion rather than of noise in the video signal. When the frame differential signal falls below the noise detection level, a noise component is eliminated by subtracting from the video signal, the frame differential signal multiplied by a certain factor K. The optimum noise elimination corresponding to the level of the noise component of a received video signal is said to be attained by taking the average of a level which becomes detecting reference of the noise component, and the absolute value level of the frame differential signal of a synchronizing part.

The abstract of JP-A-621,379 discloses a video signal processing device in which the noise quantity included in a filtered signal is detected in the flyback period when there is no video information. A digitized luminance signal including the reproduced noise is applied to a series arrangement of a filter and a variable non-linear processing circuit. The output of the non-linear processing circuit and the input digitized luminance signal are summed to form the output signal. The output of the filter is led to an absolute value circuit, and a noise level signal is obtained by an accumulator to control the non-linear input-output characteristic of the non-linear circuit. The accumulator consists of an adding circuit and D-flipflops and is controlled by the sampling clock applied to a clock input, and by a reset signal and a latch signal which are obtained from the digitized luminance signal by a timing generating circuit.

It is, *inter alia*, an object of the present invention to provide a simple and effective means for measuring the noise level of a composite television picture signal. Another purpose is to provide a control signal for setting the level of noise reduction in a television system with noise reduction. It is a further object of the invention to substantially eliminate the need for manual controls to adjust the level of noise reduction in a video system.

To this end, a first aspect of the invention provides a noise measurement method as defined in claim 1. A second aspect of the invention provides a noise measurement system as defined in claim 2. Advantageous embodiments are defined in the subclaims and in claim 11.

The present invention provides for a noise measurement system in a television signal receiver. The noise measurement system provides an automatic control signal for a noise reduction circuit in the receiver. The television receiver receives a composite television picture signal which is composed of picture information, a trigger pulse (indicating a television picture frame) (preferably the V-sync pulse), a horizontal synchronizing pulse (indicating a television scan line), a standard signal that is adjacent in time to and later than the horizontal synchronizing pulse and noise that is distributed throughout the picture signal. The noise measurement system comprises means for comparing at least two samples of the standard signal from two different times. A comparison signal is generated that is representative of the comparison of the standard signal samples. The comparison signal is then used to generate a measured noise signal that is representative of the noise in the composite television picture signal. This noise is measured by at least one comparison signal. The measured noise signal is transmitted to the noise reduction circuit upon receipt of the trigger pulse. In this manner, the noise reduction circuit receives a control signal that is representative of the

noise in the composite television picture signal.

In the Balbes et al. patent, if there is a color burst signal on the back porch, it is removed by a filter that may also remove part of the noise to be measured. Neither Storey nor Balbes et al. determine noise levels by comparing the back porch signal (or the color burst signal) from one scan line to the same signal from another scan line.

The trigger pulse may be a vertical synchronizing pulse, which occurs at least once per television picture frame, and the standard signal may be either a back porch signal or a color burst signal, which is adjacent in time to and later than a back porch signal.

In a color NTSC signal, the color burst signal is shifted in phase by 180 degrees each line with the color burst in phase every other line. Therefore, the back porch and color burst signals should be the same every other line and any differences found between these signals at the receiving end must be noise acquired along the signal path from the transmitter. The difference between two color burst signals separated by one color burst signal should be zero unless noise is present. The differences between alternate scan line color burst signals may be summed to give a total noise measure which may be used to automatically adjust the noise reduction circuit. The accumulation of color burst difference signals may be cleared out with the same trigger pulse as is used to trigger the transmission of the accumulated noise signals to the noise reduction circuit. This would mean that the noise reduction circuit may be adjusted with new noise information every picture frame. Alternatively, instead of accumulating the signals representative of noise in the picture signal, a recursive type filter may be used that would constantly update the noise reduction circuit instead of updating once every field.

These and other (more detailed) aspects of the present invention may be best understood by reference to the following detailed description of an exemplary embodiment when considered in conjunction with the drawings in which:

Fig. 1 is a block diagram of a preferred embodiment of the noise measurement system; and

Fig. 2 is a timing diagram of a composite television picture signal (not to time scale).

Referring now to the drawings in which like reference characters designate like or corresponding parts throughout the several views, there is shown in Fig. 1 a noise measurement system 10 embodying the present invention in a television signal receiver that has a noise reduction circuit (not shown). A horizontal synchronizing pulse Hsync, which occurs once each video scan line, is applied to an adjustable delay circuit 12. The horizontal synchronizing pulse (Hsync) is used as a time adjustable clock pulse during the measurement of the noise on a composite television picture signal. As is shown in Figure 2, the Hsync pulse 32 is followed in time by the back porch signal 34 and the color burst signal 36 (in a color composite television picture signl). The Hsync pulse is preceded in time by a front porch signal 38. The picture information 40 is at various voltage levels representative of a luminance between black B and white W. The time adjustment of the width and the adjustable time delay of the Hsync pulse 32 allow sampling of any particular part of the composite television picture signal when the adjusted and delayed signal is used as a clock pulse. The adjustable delay circuit 12 is adjusted to sample the back porch signal 34 or the color burst signal 36.

Referring again to Figure 1, a digitized video signal DV is applied to an 8 bit delay flip-flop circuit 14. When the Hsync pulse from the adjustable delay circuit 12 is applied to the clock input of the flip-flop circuit 14 there is an output of a portion of the digitized video from the flip-flop circuit 14. The portion of the digitized video signal that is output is determined by the time delay adjusted into the adjustable delay circuit 12. The Hsync pulse is adjusted in time so that the back porch signal 34 or the color burst signal 36 is the output from the flip-flop circuit 14. The output of the flip-flop circuit 14 is then applied to an 8 bit delay flip-flop circuit 16 which also uses Hsync as a clock pulse. The output of the flip-flop circuit 16 is applied to an 8 bit delay flip-flop circuit 18. Again, the Hsync pulse from the adjustable delay circuit 12 is used as a clock pulse in the flip-flop circuit 18.

The combination of the delay the flip-flop circuits 14, 16 and 18 provides a three line delay circuit 19. For example, if a signal from a portion of a first video line (i.e. the back porch 34 or the color burst signal 36) is at the output of the flip-flop circuit 18, then a signal from a portion of a second video line is on the output of the flip-flop circuit 16 and a signal from a portion of video line 3 is on the output of the flip-flop circuit 14. The output of the flip-flop circuit 14 is also applied to a first input A of a subtractor circuit 20 and the output of the flip-flop circuit 18 is applied to a second input B of the subtractor circuit 20. The output of the subtractor circuit 20 is the difference A-B between the signal on alternate video lines. The signals on alternate video lines, therefore, are compared.

The signal on all of the video lines (the back porch 34 or color burst signal 36) would be identical from video line to video line if there was no noise on the signal. Therefore, the difference between two alternate lines should represent the noise on the composite television picture signal. Alternate lines are compared since the phasing of the color burst signal 36 is shifted 180 degrees each video line.

If there is no color burst signal 36, i.e. a black and white composite television picture signal, there is no need for the flip-flop circuit 18 and the output of the flip-flop circuit 16 may be applied directly to the second input of the subtractor circuit 20. On the other hand, there is no problem caused by the introduction of an additional delay flip-flop circuit when back porch signals are being compared.

The difference signal output from the subtractor circuit 20 is applied to the input of an absolute value circuit 22. The output (A-B) of the absolute value circuit 22 is the absolute value of the difference between the two video lines compared. This output is applied to a first input D of a 16 bit adder circuit 24. The output C+D of the adder circuit 24 is applied to a 16 bit delay flip-flop circuit 26 whose output is applied to a second input C of the 16 bit adder circuit 24. The combination of the adder circuit 24 and the flip-flop circuit 26 comprises an accumulator circuit 27 for the accumulation of the absolute value signals from absolute value circuit 22 by the recursive addition of the output of the adder 24 to the output of the absolute value circuit 22. Alternate video line comparisons are added together, i.e. the comparison of lines 1 and 3 are added to the comparisons of lines 3 and 5, the sum of which is added to the comparisons of lines 5 and 7 and so forth. Again, the clock pulse for the flip-flop circuit 26 is the Hsync pulse from the adjustable delay circuit 12. The output of the delay flip-flop circuit 26 is also applied to a delay flip-flop circuit 28. Preferably, the clock pulse for delay flip-flop circuit 28 is the vertical synchronization pulse (Vsync), and the Vsync is also used as a reset pulse for the flip-flop circuit 26. When Vsync occurs, once per video frame, the delay flip-flop circuit 28 is triggered to output the accumulated noise signals to an encoder circuit 30. At the same time, Vsync resets the flip-flop circuit 26. The encoder circuit 30 (Enc) applies the accumulated noise signal to the noise reduction circuit (not shown) in the television receiver. The accumulation of the noise signal for the next video frame then begins again.

In this manner a representation of the noise in a composite television picture signal is applied directly to the noise reduction circuit and it adjusts the television picture signal for the amount of noise present on the signal. It is not necessary to manually adjust the noise reduction circuit to an average expected noise level. The noise reduction circuit may be continuously adjusted to compensate for continuous variations in the noise in the received signal.

The foregoing is merely an illustration of a preferred embodiment of the present invention. It is not meant to restrict the invention to the specifics of that illustration. Numerous modifications, such as the use of specialized signals as a standard signal or the trigger signal, may be made without departing from the spirit of the present invention. For example, instead of using the Vsync signal as the trigger signal for flip-flops 26 and 28, a totally independent trigger signal could be used so that the noise level is sampled after any number of scan lines. Preferably, such trigger signal would be synchronized with the Vsync or Hsync signals. Also, one may replace the accumulator circuit 27 with a recursive type filter so that the output (noise measurement signal) would be updated at a frequency equal to the sample rate. The scope of the invention as set forth in the claims is intended to include these variations and others.

In the specification above, the terminology "standard signal" is defined as a signal that occurs repeatedly in the television signal and, but for noise, would be the same at each occurrence. The back porch signal and the color burst signal are two examples of standard signals in a television signal.

Claims

1. A method of noise measurement in a composite picture signal having noise, picture information, horizontal synchronizing pulses indicating picture scan lines, and a standard signal adjacent in time to and later than the horizontal synchronizing pulse, the method being characterized by the steps of:

   sampling said standard signal to produce at least two standard signal samples from mutually different scan lines;
   storing only a small number, preferably one, of said standard signal samples;
   comparing said at least two standard signal samples to generate a comparison signal that is representative of the comparison of the at least two standard signal samples; and
   receiving the comparison signal and generating a measured noise signal that is representative of the noise in the composite picture signal as measured by at least one comparison signal.

2. A noise measurement system in a picture signal receiver having means for receiving a composite picture signal (DV) having noise, picture information (40), vertical synchronization pulses (Vsync) indicating picture frames, horizontal synchronizing pulses (Hsync) indicating picture scan lines, and a standard signal (34, 36) that occurs repeatedly in the composite picture signal and that would be the same at each occurrence but for noise, the system being characterized by:

   sampling means (19) for producing at least two samples (A, B) of the standard signal (34, 36) from mutually different scan lines;
   said sampling means (19) including means (16,18) for storing only a small number, preferably one (B), of said standard signal samples (A,B)
   means (20, 22) for comparing the at least two standard signal samples (A, B) and for generating a comparison signal (|A-B|) that is representative of the comparison of the at least two standard signal samples (A, B); and
   means (27) for receiving the comparison signal (|A-B|) and for generating a measured noise signal that is representative of the noise in the composite picture signal as measured by at least

one comparison signal (IA-BI).

3. The system of Claim 2 wherein said receiver includes a noise reduction circuit and further comprising:

   means for producing trigger pulses (Vsync) at selected time intervals; and
   means (28, 30) for receiving the trigger pulses (Vsync) and for transmitting the measured noise signal as a control signal to the noise reduction circuit when each trigger pulse (Vsync) is received.

4. The system of Claim 3 wherein the trigger pulse (Vsync) is the vertical synchronizing pulse.

5. The system of Claim 2 wherein the composite picture signal (DV) includes a back porch signal (34) and the standard signal is the back porch signal (34).

6. The system of Claim 2 wherein the composite picture signal (DV) includes a color burst signal (36) and the standard signal is the color burst signal (36).

7. The system of Claim 2 wherein said sampling means (19) for producing at least two standard signal samples (A, B) comprise:

   first means (14) for producing a first sample (A) from a first scan line; and
   second means (16, 18) for producing a second sample (B) from a second scan line, where said first and second scan lines are both even scan lines or both odd scan lines.

8. The system of Claim 2 wherein the means (20, 22) for comparing comprise:

   means (20) for finding a difference between the two samples (A, B) of the standard signal (34, 36) and for generating a difference signal (A-B) that is representative of the difference; and
   means (22) for producing an absolute value signal (IA-BI) corresponding to the absolute value of the difference signal (A-B).

9. The system of Claim 2 wherein the means (27) for receiving the comparison signal comprise means (24, 26) for accumulating successive comparison signals (IA-BI) to generate the measured noise signal.

10. The system of Claim 9 wherein the means (24, 26) for accumulating comprise:

   storage means (26) having an input and an output for producing an output signal;
   means (24) for adding the comparison signals (IA-BI) to the output signal of the storage means to furnish a sum signal to the input of said storage means (26), whereby the output signal constitutes accumulated successive comparison signals.

11. A noise measurement system in a picture signal receiver having a noise reduction circuit and means for receiving a composite picture signal (DV) having noise, picture information (40), horizontal synchronizing pulses (32, Hsync) indicating picture scan lines, and a standard signal (34, 36) adjacent in time to and later than the horizontal synchronizing pulses (32, Hsync), said standard signal (34, 36) occurring repeatedly in the picture signal and being the same at each occurrence except for noise, the system being characterized by:

   an adjustable delay circuit (12) for receiving the horizontal synchronizing pulse (Hsync) and for generating a time adjustable clock pulse;
   a first delay circuit (14) for receiving the picture signal (DV) and for generating a first delayed output signal (A) upon receipt of the clock pulse;
   a second delay circuit (16) for receiving the first delayed output signal (A) and for generating a second delayed output signal upon receipt of the clock pulse;
   a third delay circuit (18) for receiving the second delayed output signal and for generating a third delayed output signal (B) upon receipt of the clock pulse;
   a subtracter circuit (20) for generating a difference signal that is representative of the difference (A-B) between the third delayed output signal (B) and the first delayed output signal (A);
   an absolute value circuit (22) for receiving the difference signal (A-B) and for generating an absolute value signal (IA-BI) that is representative of the absolute value of the difference signal (A-B);
   an accumulation circuit (27) for producing a summation signal corresponding to the additive sum of the absolute value signals (IA-BI) from the absolute value circuit (22), and then zeroing (R) the summation signal upon receipt of a trigger pulse (Vsync);
   an output circuit (28) for receiving the summation signal from the accumulation circuit (27) and for generating a measured noise signal upon receipt of the trigger pulse (Vsync); and
   an encoder circuit (30) for receiving the measured noise signal and for generating a control signal for the noise reduction circuit, whereby the noise reduction circuit receives a control signal that is representative of the noise throughout the composite picture signal.

Patentansprüche

1. Verfahren zur Geräusch messung in einem Videosignalgemisch mit Geräusch, Bildinformation, Horizontalsynchronisationsimpulsen zur Darstellung von Bildabtastzeilen und mit einem Standardsignal zeitlich neben dem Horizontalsynchronisationsimpuls und später als dieser Impuls, wobei das Verfahren durch folgende Schritte gekennzeichnet ist:

   das Abtasten des Standardsignals zum Erzeugen von wenigstens zwei Standardsignalabtastungen aus gegenseitig verschiebenen Abtastzeilen,
   das Speichern nur einer geringen Anzahl vorzugsweise einer der Standardsignalabtastungen,
   das Vergleichen der wenigstens zwei Standardsignalabtastungen zum Erzeugen eines Vergleichssignals als Darstellung des Vergleichs der wenigstens zwei Standardsignalabtastungen, und
   das Empfangen des Vergleichssignals und das Erzeugen eines gemessenen Geräuschsignals als Darstellung des Geräusches im Videosignalgemisch nach der Messung mit wenigstens einem Vergleichssignal.

2. Geräuschmeßsystem in einem Bildsignalempfanger mit Mitteln zum Empfangen eines Videosignalgemisches (DV) mit Geräusch, Bildinformation (40), Vertikalsynchronisationsimpulsen (Vsync) zur Anzeige von Videohalbbildern, mit Horizontalsynchronisationsimpulsen (Hsync) zur Anzeige von Videoabtastzeilen und mit einem Standardsignal (34, 36), das wiederholt im Videosignalgemisch erscheint und gleich ist bei jedem Erscheinen mit Ausnahme des Geräusches, wobei das System durch folgende Elemente gekennzeichnet ist:

   Abtastmittel (19) zum Erzeugen von wenigstens zwei Abtastungen (A, B) des Standardsignals (34, 36) aus gegenseitig verschiedenen Abtastzeilen,
   die Abtastmittel (19) mit Mitteln (16, 18) zum Speichern nur einer geringen Anzahl, vorzugsweise einer (B), der Standardsignalabtastungen (A, B),
   Mittel (20, 22) zum Vergleichen der wenigstens zwei Standardsignalabtastungen (A, B) und zum Erzeugen eines Vergleichssignals (IA-BI) als Darstellung des Vergleichs der wenigstens zwei Standardsignalabtastungen (A, B), und
   Mittel (27) zum Empfangen des Vergleichssignals (IA-BI) und zum Erzeugen eines gemessenen Geräuschsignals als Darstellung des Geräusches im Videosignalgemisch nach der Messung mit wenigstens einem Vergleichssignal (IA-BI).

3. System nach Anspruch 2, in dem der Empfänger eine Geräuschreduktionsschaltung enthält und außerdem:

   Mittel zum Erzeugen von Triggerimpulsen (Vsync) bei ausgewählten Zeitintervallen, und Mittel (28, 30) zum Empfangen der Triggerimpulse (Vsync) und zum Übertragen des gemessenen Geräuschsignals als Steuersignal zur Geräuschreduktionsschaltung, wenn jeder Triggerimpuls (Vsync) empfangen wird.

4. System nach Anspruch 3, in dem der Triggerimpuls (Vsync) der Vertikalsynchronisationsimpuls ist.

5. System nach Anspruch 2, in dem das Videosignalgemisch (DV) ein hinteres Schwarzschultersignal (34) enthält und das Standardsignal das hintere Schwarzschultersignal (34) ist.

6. System nach Anspruch 2, in dem das Videosignalgemisch (DV) ein Farbburstsignal (36) enthält und das Standardsignal das Farbburstsignal (36) ist.

7. System nach Anspruch 2, in dem die Abtastmittel (19) zum Erzeugen von wenigstens zwei Standardsignalabtastungen (A, B) folgende Mittel enthalten:

   ein erstes Mittel (14) zum Erzeugen einer ersten Abtastung (A) aus einer ersten Abtastzeile, und ein zweites Mittel (16, 18) zum Erzeugen einer zweiten Abtastung (B) aus einer zweiten Abtastzeile, wobei die ersten und zweiten Abtastzeilen beide geradzahlige Abtastzeilen oder beide ungeradzahlige Abtastzeilen sind.

8. System nach Anspruch 2, in dem das Mittel (20, 22) zum Vergleichen folgende Mittel enthält:

   Mittel (20) zum Feststellen eines Unterschieds zwischen den beiden Abtastungen (A, B) des Standardsignals (34, 36) und zum Erzeugen eines Differenzsignals (A-B) als Darstellung des Unterschieds, und
   Mittel (22) zum Erzeugen eines Absolutwertsignals (IA-BI) entsprechend dem Absolutwert des Differenzsignals (A-B).

9. System nach Anspruch 2, in dem das Mittel (27) zum Empfangen des Vergleichssignals Mittel (24, 26) zum Aufzahlen aufeinanderfolgender Vergleichssignale (IA-BI) zum Erzeugen des gemessenen Geräuschsignals enthält.

10. System nach Anspruch 9, in dem das Mittel (24, 26) zum Aufzählen folgende Elemente enthält:

Speichermittel (26) mit einem Eingang und einem Ausgang zum Erzeugen eines Ausgangssignals,
Mittel (24) zum Addieren der Vergleichssignale (IA-BI) beim Ausgangssignal des Speichermittels zum Liefern eines Summensignals an den Eingang des Speichermittels (26), wobei das Ausgangssignal aufgezählte aufeinanderfolgende Vergleichssignale darstellt.

11. Geräuschmeßsystem in einem Bildsignalempfänger mit einer Geräuschreduktionsschaltung und mit Mitteln zum Empfangen eines Videosignalgemisches (DV) mit Geräusch, Bildinformation (40) Horizontalsynchronisationsimpulsen (32, Hsync) zum Anzeigen von Bildabtastzeilen, und mit einem Standardsignal (34, 36) neben den Horizontalsynchronisationsimpulsen (32, Hsync) und später als diese Impulse, wobei das Standardsignal (34, 36) wiederholt im Videosignal erscheint und bei jedem Erscheinen mit Ausnahme des Geräusches gleich ist, wobei das System durch folgende Elemente gekennzeichnet ist:

eine einstellbare Verzögerungsschaltung (12) zum Empfangen des Horizontalsynchronisationsimpulses (Hsync) und zum Erzeugen eines zeitlich einstellbaren Taktimpulses,
eine erste Verzögerungsschaltung (14) zum Empfangen des Videosignals (DV) und zum Erzeugen eines ersten verzögerten Ausgangssignals (A) beim Empfang des Taktimpulses,
eine zweite Verzögerungsschaltung (16) zum Empfangen des ersten verzögerten Ausgangssignals (A) und zum Erzeugen eines zweiten verzögerten Ausgangssignals beim Empfang des Taktimpulses,
eine dritte Verzögerungsschaltung (18) zum Empfangen des zweiten verzögerten Ausgangssignals und zum Erzeugen eines dritten verzögerten Ausgangssignals (B) beim Empfang des Taktimpulses,
eine Subtrahierschaltung (20) zum Erzeugen eines Differenzsignals als Darstellung des Unterschieds (A-B) zwischen dem dritten verzögerten Ausgangssignal (B) und dem ersten verzögerten Ausgangssignal (A),
eine Absolutwertschaltung (22) zum Empfangen des Differenzsignals (A-B) und zum Erzeugen eines Absolutwertsignals (IA-BI) als Darstellung des Absolutwerts des Differenzsignals (A-B),
eine Aufzählschaltung (27) zum Erzeugen eines Summiersignals entsprechend der Addiersumme der Absolutwertsignale (IA-BI) aus der Absolutwertschaltung (22) und darauf die Nullrückstellung (R) des Summiersignals beim Empfang eines Triggerimpulses (Vsync),
eine Ausgangsschaltung (28) zum Empfangen des Summiersignals aus der Aufzählschaltung (27) und zum Erzeugen eines gemessenen Geräuschsignals beim Empfang des Triggerimpulses (Vsync), und
eine Codierschaltung (30) zum Empfangen des gemessenen Geräuschsignals und zum Erzeugen eines Steuersignals für die Geräuschreduktionsschaltung, wobei die Geräuschreduktionsschaltung ein Steuersignal als Darstellung des Geräusches im ganzen Signalgemisch empfängt.

Revendications

1. Procédé de mesure du bruit dans un signal d'image composite contenant du bruit, des informations d'image, des impulsions de synchronisation horizontale indiquant des lignes de balayage d'image, et un signal standard adjacent dans le temps et ultérieur à l'impulsion de synchronisation horizontale, le procédé étant caractérisé par les étapes consistant à :

échantillonner ledit signal standard pour produire au moins deux échantillons de signal standard à partir de lignes de balayage mutuellement différentes;
ne stocker qu'un petit nombre, de préférence un, desdits échantillons de signal standard;
comparer lesdits au moins deux échantillons de signal standard pour générer un signal de comparaison qui est représentatif de la comparaison des au moins deux échantillons de signal standard, et
recevoir le signal de comparaison et générer un signal de bruit mesuré qui est représentatif du bruit dans le signal d'image composite tel que mesuré par au moins un signal de comparaison.

2. Système de mesure du bruit dans un récepteur de signaux d'image ayant des moyens pour recevoir un signal d'image composite (DV) contenant du bruit, des informations d'image (40), des impulsions de synchronisation verticale (Vsync) indiquant des trames d'image, des impulsions de synchronisation horizontale (Hsync) indiquant des lignes de balayage d'image et un signal standard (34, 36) qui se présente de manière répétée dans le signal d'image composite et qui serait le même à chaque fois, s'il n'y avait le bruit, le système étant caractérisé par :

des moyens d'échantillonnage (19) pour produire au moins deux échantillons (A, B) du signal standard (34, 36) à partir de lignes de balayage mutuellement différentes;

lesdits moyens d'échantillonnage (19) comprenant des moyens (16, 18) pour ne stocker qu'un petit nombre, de préférence un (B), desdits échantillons de signal standard (A, B);
des moyens (20, 22) pour comparer les au moins deux échantillons de signal standard (A, B) et pour générer un signal de comparaison (IA-BI) qui est représentatif de la comparaison des au moins deux échantillons de signal standard (A, B), et
des moyens (27) pour recevoir le signal de comparaison (IA-BI) et pour générer un signal de bruit mesuré qui est représentatif du bruit dans le signal d'image composite tel que mesuré par au moins un signal de comparaison (IA-BI).

3. Système selon la revendication 2, dans lequel ledit récepteur comprend un circuit de réduction du bruit, et comprenant, en outre :

des moyens pour produire des impulsions de déclenchement (Vsync) à des intervalles de temps sélectionnés, et
des moyens (28, 30) pour recevoir les impulsions de déclenchement (Vsync) et pour transmettre le signal de bruit mesuré sous la forme d'un signal de commande au circuit de réduction du bruit lorsque chaque impulsion de déclenchement (Vsync) est reçue.

4. Système selon la revendication 3, dans lequel l'impulsion de déclenchement (Vsync) est l'impulsion de synchronisation verticale.

5. Système selon la revendication 2, dans lequel le signal d'image composite (DV) comprend un signal de palier arrière (34) et le signal standard est le signal de palier arrière (34).

6. Système selon la revendication 2, dans lequel le signal d'image composite (DV) comprend un signal de synchronisation couleur (36) et le signal standard est le signal de synchronisation couleur (36).

7. Système selon la revendication 2, dans lequel lesdits moyens d'échantillonnage (19) pour produire au moins deux échantillons de signal standard (A, B) comprennent :

un premier moyen (14) pour produire un premier échantillon (A) à partir d'une première ligne de balayage, et
un deuxième moyen (16, 18) pour produire un deuxième échantillon (B) à partir d'une deuxième ligne de balayage, ladite première et ladite deuxième lignes de balayage étant toutes deux des lignes de balayage paires ou toutes deux des lignes de balayage impaires.

8. Système selon la revendication 2, dans lequel les moyens de comparaison (20, 22) comprennent :

des moyens (20) pour trouver une différence entre les deux échantillons (A, B) du signal standard (34, 36) et pour générer un signal de différence (A-B) qui est représentatif de la différence, et
des moyens (22) pour produire un signal de valeur absolue (IA-BI) correspondant à la valeur absolue du signal de différence (A-B).

9. Système selon la revendication 2, dans lequel les moyens (27) pour recevoir le signal de comparaison comprennent des moyens (24, 26) pour accumuler des signaux de comparaison successifs (IA-BI) pour générer le signal de bruit mesuré.

10. Système selon la revendication 9, dans lequel les moyens accumulateurs (24, 26) comprennent :

des moyens de stockage (26) ayant une entrée et une sortie pour produire un signal de sortie, et
des moyens (24) pour additionner les signaux de comparaison (IA-BI) au signal de sortie desdits moyens de stockage pour délivrer un signal de somme à l'entrée desdits moyens de stockage, de telle sorte que le signal de sortie constitue des signaux de comparaison successifs accumulés.

11. Système de mesure du bruit dans un récepteur de signaux de télévision ayant un circuit de réduction de bruit et des moyens pour recevoir un signal d'image composite (DV) contenant du bruit, des informations d'image (40), des impulsions de synchronisation horizontale (32, Hsync) indiquant des lignes de balayage d'image, et un signal standard (34, 36) adjacent dans le temps et ultérieur aux impulsions de synchronisation horizontale (32, Hsync), ledit signal standard (34, 36) se présentant de manière répétée dans le signal d'image et étant le même à chaque fois, s'il n'y avait le bruit, le système étant caractérisé par :

un circuit de temporisation réglable (12) pour recevoir l'impulsion de synchronisation horizontale (Hsync) et pour générer une impulsion d'horloge réglable dans le temps;
un premier circuit de temporisation (14) pour recevoir le signal d'image (DV) et pour générer un premier signal de sortie retardé (A) à la réception de l'impulsion d'horloge;
un deuxième circuit de temporisation (16) pour recevoir le premier signal d'horloge retardé (A) et pour générer un deuxième signal d'entrée retardé à la réception de l'impulsion d'horloge;
un troisième circuit de temporisation (18) pour

recevoir le deuxième signal de sortie retardé et pour générer un troisième signal de sortie retardé (B) à la réception de l'impulsion d'horloge;
un circuit de soustraction (20) pour générer un signal de différence qui est représentatif de la différence (A-B) entre le troisième signal de sortie retardé (B) et le premier signal de sortie retardé (A);
un circuit de valeur absolue (22) pour recevoir le signal de différence (A-B) et pour générer un signal de valeur absolue (IA-BI) qui est représentatif de la valeur absolue du signal de différence (A-B);
un circuit d'accumulation (27) pour produire un signal de sommation correspondant à la somme additive des signaux de valeur absolue (IA-BI) du circuit de valeur absolue (22), et pour remettre alors à zéro (R) le signal de sommation à la réception d'une impulsion de déclenchement (Vsync);
un circuit de sortie (28) pour recevoir le signal de sommation du circuit d'accumulation (27) et pour générer un signal de bruit mesuré à la réception de l'impulsion de déclenchement (Vsync), et
un circuit de codage (30) pour recevoir le signal de bruit mesuré et pour générer un signal de commande pour le circuit de réduction du bruit, de telle sorte que le circuit de réduction du bruit reçoive un signal de commande qui est représentatif du bruit dans la totalité du signal d'image composite.

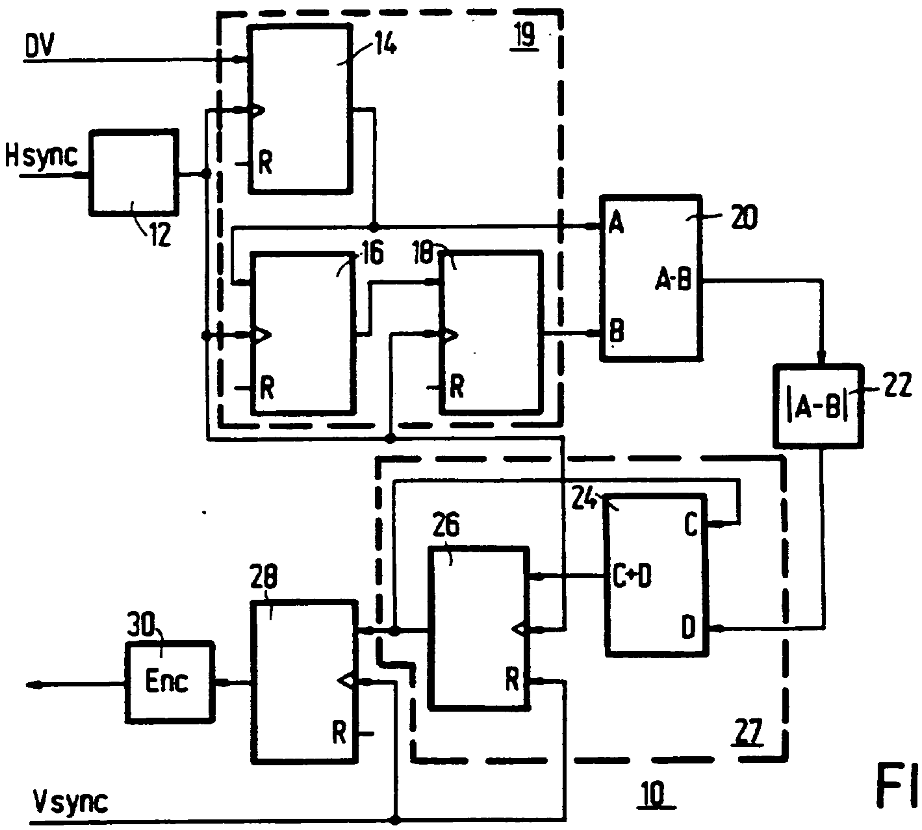
DV
14
19
Hsync
R
12
A
20
16
18
A-B
B
R
R
|A-B|
22
24
26
C
C+D
28
30
D
Enc
R
R
27
Vsync
10

FIG.1

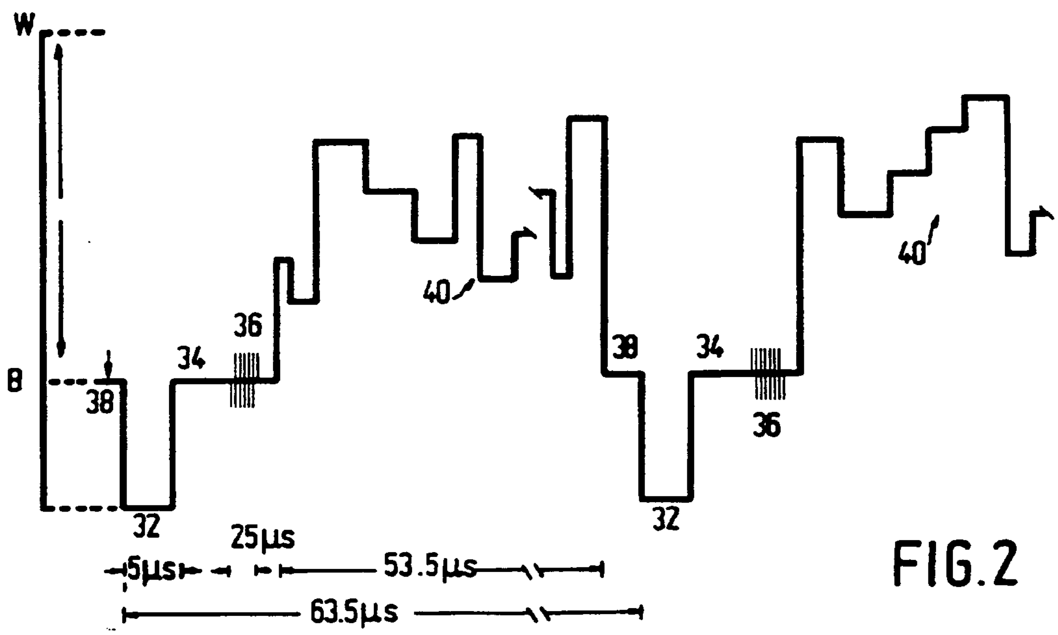
W
B
38
34
36
40
38
34
36
40
32
32
25µs
5µs
53.5µs
63.5µs

FIG.2